INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :
A61J 11/04, 17/00, B29C 45/16

A1

(11) International Publication Number: WO 86/ 06273

(43) International Publication Date: 6 November 1986 (06.11.86)

(21) International Application Number: PCT/GB86/00215

(22) International Filing Date: 16 April 1986 (16.04.86)

(31) Priority Application Numbers: 8510348
8526456

(32) Priority Dates: 23 April 1985 (23.04.85)
28 October 1985 (28.10.85)

(33) Priority Country: GB

(71) Applicant: L.S.R. BABY PRODUCTS (U.K.) LIMITED [GB/GB]; Unit 18, The Fort Industrial Park, Dunlop Way, Chester Road, Birmingham B35 7AR (GB).

(72) Inventor: VICHAI, Plaphongphanich ; No. 47 501 67 Sukhumnit Road, Bangkok (TH).

(74) Agents: HANDS, Horace, Geoffrey et al.; George Fuery & Co., Whitehall Chambers, 23 Colmore Row, Birmingham B3 2BL (GB).

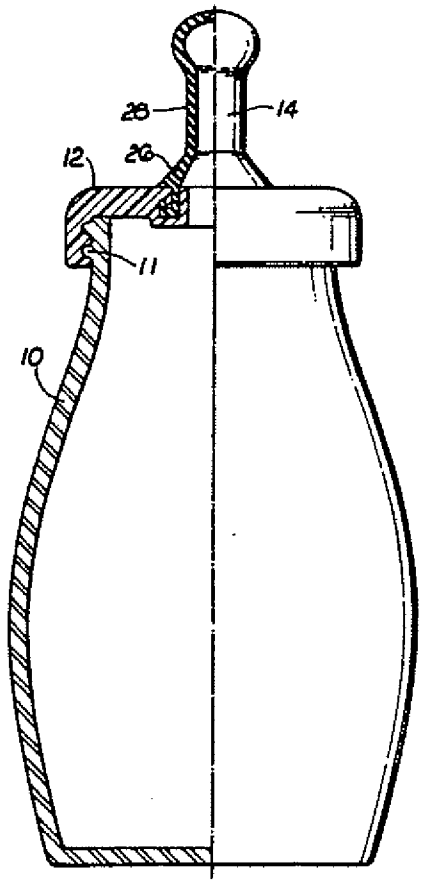
(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent).

Published
With international search report.

(54) Title: NIPPLE

(57) Abstract

A babies' feeding bottle teat (14) made of liquid silicon rubber moulded to shape and part vulcanized in the mould, and is connected to a cap (12) made of polypropylene or similar stiffer material. The cap (12) and teat (14) are interlocked together by the moulding operations. The description includes comparable teat substitute used in a baby soother or pacifier, in which case the teat is moulded to a mouth shield by a generally similar technique.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GA**	Gabon	**MR**	Mauritania
AU	Australia	**GB**	United Kingdom	**MW**	Malawi
BB	Barbados	**HU**	Hungary	**NL**	Netherlands
BE	Belgium	**IT**	Italy	**NO**	Norway
BG	Bulgaria	**JP**	Japan	**RO**	Romania
BR	Brazil	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SN**	Senegal
CH	Switzerland	**LI**	Liechtenstein	**SU**	Soviet Union
CM	Cameroon	**LK**	Sri Lanka	**TD**	Chad
DE	Germany, Federal Republic of	**LU**	Luxembourg	**TG**	Togo
DK	Denmark	**MC**	Monaco	**US**	United States of America
FI	Finland	**MG**	Madagascar		
FR	France	**ML**	Mali		

NIPPLE

This invention relates to babies's feeding bottles and also to pacifiers, which provide a nipple or a nipple substitute.

The preferred material for a nipple (which term is to include a nipple substitute) at the present time is liquid silicone rubber (which is vulcanised to provide the required stiffness/flexibility), because of the purity possible with such material. But it is expensive.

The conventional construction of babies' feeding bottle has the nipple provided with a radially extending flange which is trapped between the end of the bottle per se and a threaded cap. The flange has to be substantial in surface area and also in thickness to provide a reasonable degree of security, which increases the volume of material required, and even then there is the possibility of the nipple being pulled out of the cap by the baby.

Generally similar constructions have been proposed for pacifiers, but because of the risk of a baby taking the flange into its mouth it has even been suggested that the complete pacifier might be made in one piece of the required material, with a penalty in the expense which will be plain from the foregoing. Making the flange (or the end of the bottle) larger in area to reduce the risk of the baby ingesting the whole increases the amount of the expensive material needful. The flange, or the end of the bottle which prevents such ingestion or contributes to such prevention is herein called a "mouth shield".

The objects of the present invention are (firstly) to provide improvements allowing the best materials to be used for these purposes at less expense and with greater security and (secondly) to expedite manufacture.

According to the invention, a feeding or pacifying nipple for a baby is made of liquid silicon rubber and has an adjacent mouth shield, and is characterised in that the shield is made of a different stiffer material moulded separately from the nipple but connected therewith.

Polypropylene may be used for the shield.

Suitable grades of liquid silicon rubber and polypropylene have melting points separated by a temperature difference of the order of 200°F (93°C). However, the required pressure of injection of the plasticized materials may be of the order of 10:1 in the reverse direction as compared to the melting points; that is to say the lower melting point polypropylene needs the higher injection pressure. These differences may be exploited in different ways in order to produce interlocked mouldings of the two materials.

The invention is now more particularly described with reference to the accompanying drawings wherein:-

Figure 1 is an elevation, partly in section, showing a baby's feeding bottle;

Figure 2 is an enlarged fragmentary view; and

Figure 3 is a somewhat diagrammatic sectional elevation to illustrate the method employed in the design according to Figures 1 to 3;

Figure 4 is a view similar to Figure 1 of the second embodiment;

Figure 5 is a sectional plan taken on the line 5-5 of Figure 4;

Figure 6 is a sectional elevation taken on the line6-6 of Figure 4;

Figure 7 is a sectional elevation through a multi-station moulding machine; and

Figures 8 and 9 show, on a larger scale, further details of the apparatus and moulding cycle.

Referring first to Figures 1 to 3 of the drawings, a feeding bottle comprises an entirely conventional bottle per se 10 provided with male screwthreads 11 around the opening or mouth of the bottle.

Cap 12 has complementary female screw threads and is, in the illustrated assembly of Figure 1 ready for use, effectively integral and of one piece construction with the nipple 14, although made of two pieces. That is to say it is not intended to be separable.

The nipple may be of circular cross-section throughout its length or it may be of any required and different cross-section for example of so-called orthodontic shape in which the nipple is symmetrical about a plane containing the longitudinal axis, and is shaped to conform more closely to the contour of the human mouth.

In any event, whichever shape of nipple is provided, and whether the nipple is a true nipple as illustrated or is a nipple substitute, viz

a baby pacifier or "dummy" the nipple is to be made substantially unitary with the screw cap part 12 which may be considered to be a mouth-shield, by moulding the materials of the cap 12 and the nipple in a manner which interlocks the two together.

To this end, and as best illustrated in Figure 2 in this embodiment, the nipple comprises a cylindrical portion 16, a relatively narrow radially and externally directed flange 18 at one end of this portion, and a further, but larger diameter, cylindrical portion 20 extending parallel to the part 16. An annular opening 24 is left between the tapering portion 26 ((which leads to the tubular portion 28 through which food is extracted by the baby) and said opening may be of the same dimensions axially of the bottle as the gap radially separating the cylindrical portions 16 and 20 (but in the illustrations is larger).In other words the nipple is moulded with a hook shape as viewed in radial section.

The nipple may be made in a mould cavity including a core defining the internal configuration, by an injection moulding process with the material of the nipple, that is to say with silicon rubber, being subsequently vulcanised in the mould. The mould parts are separated and the nipple peeled from the core.

The cap 12 is then moulded from a material having a lower melting point than that of the rubber, and polypropylene is a suitable and preferred material. The cap is moulded in a cavity which largely provides for the exterior and interior shape of the cap, but which also accommodates the nipple and provides

a core to support the interior of the nipple.

Figure 3 shows one possible assembly arrangement with the nipple 14 supported on a plug-like core piece 34 carried in a central circular recess in an internal mould part 36 cooperating with an external mould part 38. It will be seen that the nipple wall at 26 is trapped between the plug 34 and the mould part 38, with the whole of the configuration 16, 18, 20, 24, located in a cavity between the mould parts 36 and 38. The mould part 36 is provided with a configuration at 42 to form an internal screwthread or like in the cap part 12 which is to be moulded in the cavity, the injected molten material filling the annulus 24 of the space 30 to interlock the parts together against inadvertent separation, particularly by the baby when the article is in use.

The plug or mandrel 34 is waisted to allow the injected material forming the cap to form an annulus 44 about the plug and inside the part 16 but connected to the body of the cap. Thus the relatively soft and flexible rubber of the nipple is locked into the moulded configuration of the polypropylene or like. In other words the hook shape becomes substantially enclosed and its interior filled with the stiffer material to interlock the parts.

It will be appreciated that the core part 34 could be made integral with the part 36. Alternatively, it may be possible to use one of the main core parts to form some of the interior of the nipple during the moulding and vulcanization of the liquid silicon rubber, leaving the nipple on that core

part and then removing a sleeve to create the space 44 Figure 3, and using the plug in cooperation with additional mould part or parts to form the cap.

It will be appreciated that in use, it may be necessary to rotate the mould part 36 with the screwthread formation 42 in order to separate it from the cap; however, with some materials and screw-thread designs separation from the mould whilst the plastics material is hot may be possible without such rotation.

Preferably the design of the screw-thread is such that mould rotation is unnecessary and the cap can be pulled off the forming tool.

If the invention is applied to a pacifier, the cap 12 will be replaced by a mouth shield, and the nipple 14 by a nipple substitute. The interengagement of the latter and the mouth shield will be generally the same as that of nipple and cap in the illustrated embodiment.

Turning now to Figures 4 to 6, this second embodiment of the invention uses a similar bottle and indeed generally similar cap which forms a mouth shield, but the cap as best seen in Figures 5 and 6 is moulded first instead of second. The cap is also made of polypropylene or like, with a central large circular aperture 50 and a ring of small apertures 52 surrounding that aperture 50.

Subsequently the liquid silicon rubber is injected into a cavity defined in part by the cap to form the nipple (or the substitute in the case

of a pacifier) per se terminating in a generally cylindrical portion 54 extending through the aperture 50. A planar flange 56 is moulded with the portion 50, on the inside (in use) of the cap with the peripheral bead 58 of dovetail section to key into a like slot moulded in the polypropylene or like.

The radially innermost marginal area of the flange 56 is located below (in the illustration of Figure 6) the area of the ring of small apertures. A like flange 60 overlies them, and the liquid silicon rubber also fills them, forming a series of posts 62. These anchor the soft rubber to the hard polypropylene in a particularly efficacious manner ensuring that the nipple cannot be separated from the mouth shield except by an actual shearing of the rubber at each and everyone of those posts.

It is surprisingly found possible to make this construction with the rubber injected as the second stage although the temperature of the same is well above the melting point of the previously formed cap. The difference in melting points may be of the order of 93°C. However, the required injection pressure for the rubber is relatively low so that the relative stiffness of the first moulded part, which even if hot, is at a temperature below its actual melting point at the time when the rubber is injected, can serve to maintain the shape of the first moulded part at least until the injection cycle is completed, whereafter the injected rubber contact with the first moulded part will support the polypropylene cap, and thereafter the temperature of the rubber falls so that any risk of damage to the first moulded part decreases.

It is preferred to pre-mould the polypropylene or like with an enlarged beaded or headed section next to the opening 50, at 64, and preferably also with grooves or serrations 66 on the flange adjacent faces. The fine detail of these may be blurred as a result of softening action of the higher temperature rubber, but in Applicants' experiments this has not been found disadvantageous.

Figure 7 illustrates details of a practical apparatus for making the Figures 4 to 6 version. This utilises a rotatable structure 70 carrying a series of generally cylindrical sleeves 72 which co-operate with core mandrels 74 to define the required internal shape of the caps to be moulded from a harder material, that is the polypropylene or the like. In this illustrated embodiment, two caps are moulded simultaneously in side by side cavities. The members 74 also form the large central holes and the ring of small holes in each cap.

To complete the cap forming cavity a second mould part 76 is employed which is clamped against the adjacent face of the rotatable part 70 and also against the end face of the mandrel 74. Thus the outer shape of the cap is defined. Injection ports 78 provide for flow of the plasticized material.

After forming the caps, i.e. injection of the plasticized material and cooling to solidify, mould parts 76 and mandrels 74 are moved in opposite directions (arrows A Figure 7) to withdraw the mandrels from the sleeves 72 and withdraw the mould part 76 from the formed caps. The mandrels 78 are then inserted and the mould parts 80 positioned generally as shown on the left hand side of Figure 7.

It is to be observed that the mould parts 80 are arranged to hold the caps in place, for example by contact between the parts 80 and the caps at a pair of annular zones, in particular 82, 84, as best seen in Figure 9. Between these zones the mould part 80 is spaced from the cap to minimise heat transfer between the mould part 80 and the cap. Such heat transfer may be further limited by arranging for the part 80 to be water-cooled, for example by flow through passages 88.

The new mandrels used in this subsequent and teat forming stage are provided with an appropriate teat-forming shape complementary to the like cavity in the parts 86 and contact the formed caps at an annular zone 90 generally facing the zone 82 at which the mould part 80 contacts the cap. Hence each cap is firmly gripped between the confronting zones 82, 90.

The mandrel may also be water-cooled if required, and conveniently is provided with a thermo-couple 92 for temperature sensing.

After injection of the liquid silicon rubber, it is necessary to maintain an elevated temperature for a required time to accomplish the required degree of vulcanisation. When this is completed, the mould parts are separated to allow fresh cycle of operations.

CLAIMS

1. A feeding or pacifying nipple for a baby is made of liquid silicon rubber and has an adjacent mouth shield, and is characterised in that the shield is made of a different stiffer material and is moulded separately from the nipple and connected therewith.

2. A feeding or pacifying nipple as claimed in Claim 1 characterised in that the stiffer material is polypropylene.

3. A method of making a feeding or pacifying nipple for a baby, the nipple being made of liquid silicon rubber and the construction including an adjacent mouth shield, characterised in that the nipple and shield are moulded one after the other, the second moulding causing the two different materials to be interlocked together.

4. A method as claimed in Claim 3 wherein the rubber is moulded first at a higher temperature than the second and stiffer material of the cap.

5. A method as claimed in Claim 3 wherein the mouth shield or cap is moulded first at a lower temperature than that used for the subsequent nipple moulding.

6. A feeding or pacifying nipple made according to Claim 4 characterised in that the interlocking of the parts is effected by making the nipple with a hook shape in radial section, and subsequently enclosing and filling the hook with stiffer material.

7. A feeding or pacifying nipple made by the method of Claim 5 characterised in that the interlocking is effected by making the stiffer first formed material with a ring of holes and moulding the softer rubber through and about those holes.

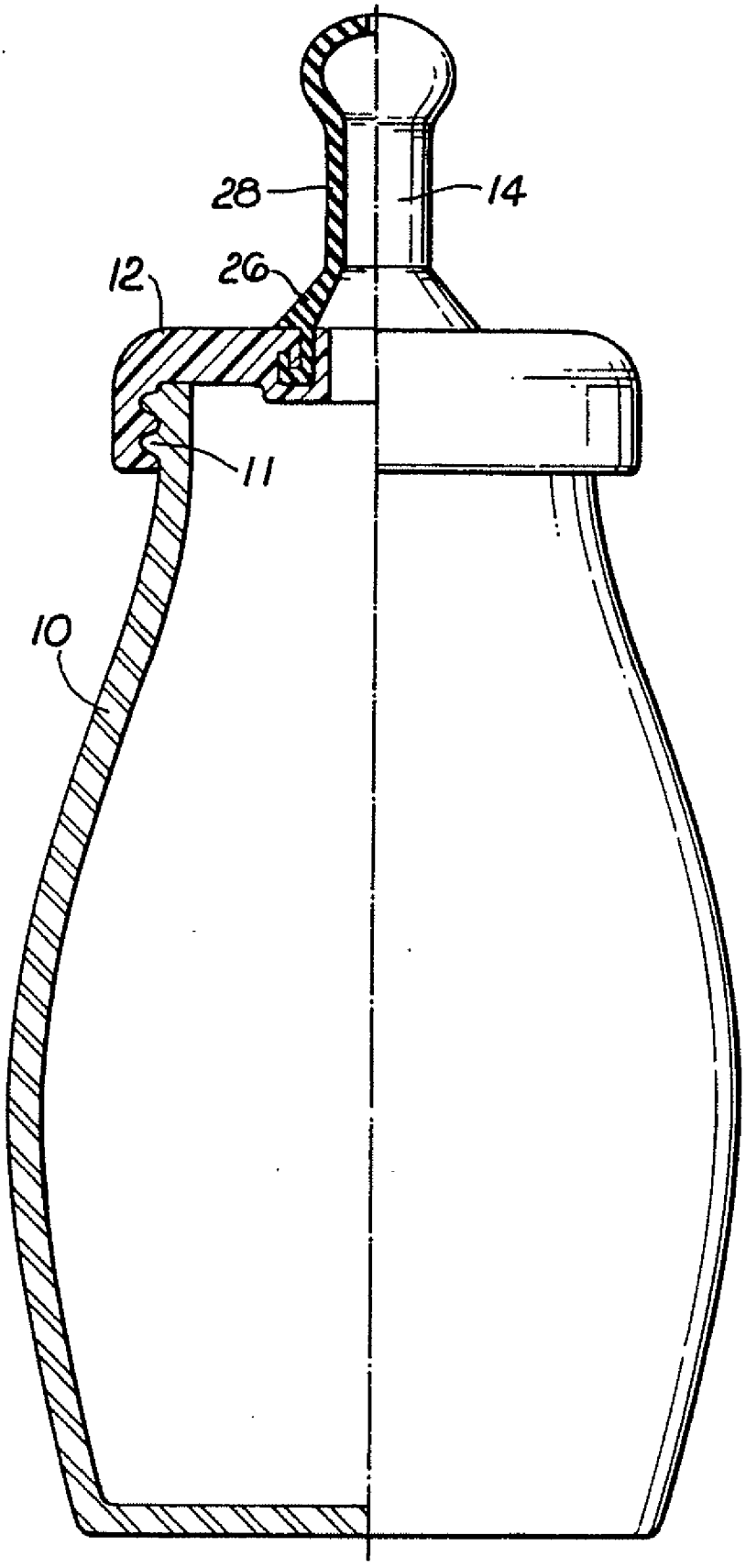


Fig. 1

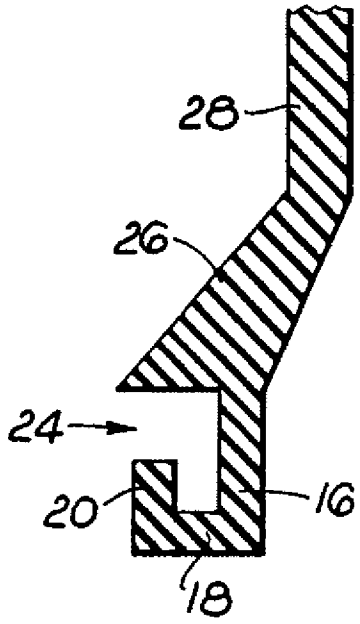


Fig. 2

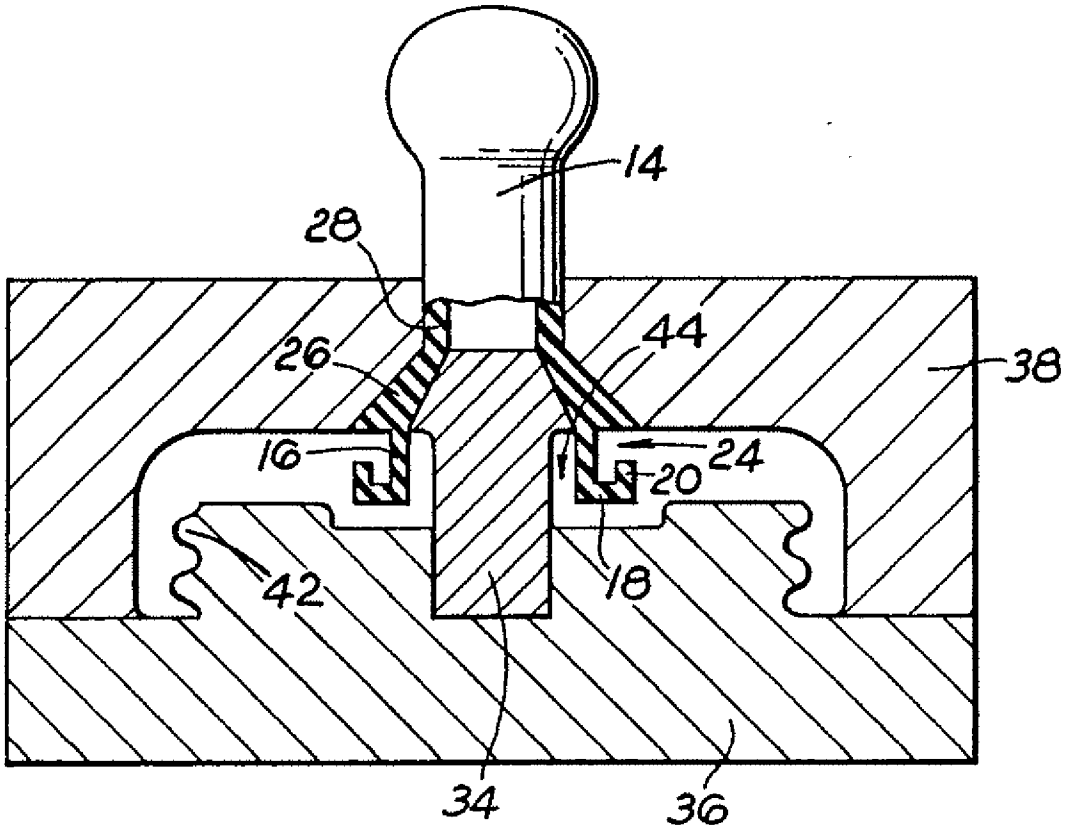


Fig. 3

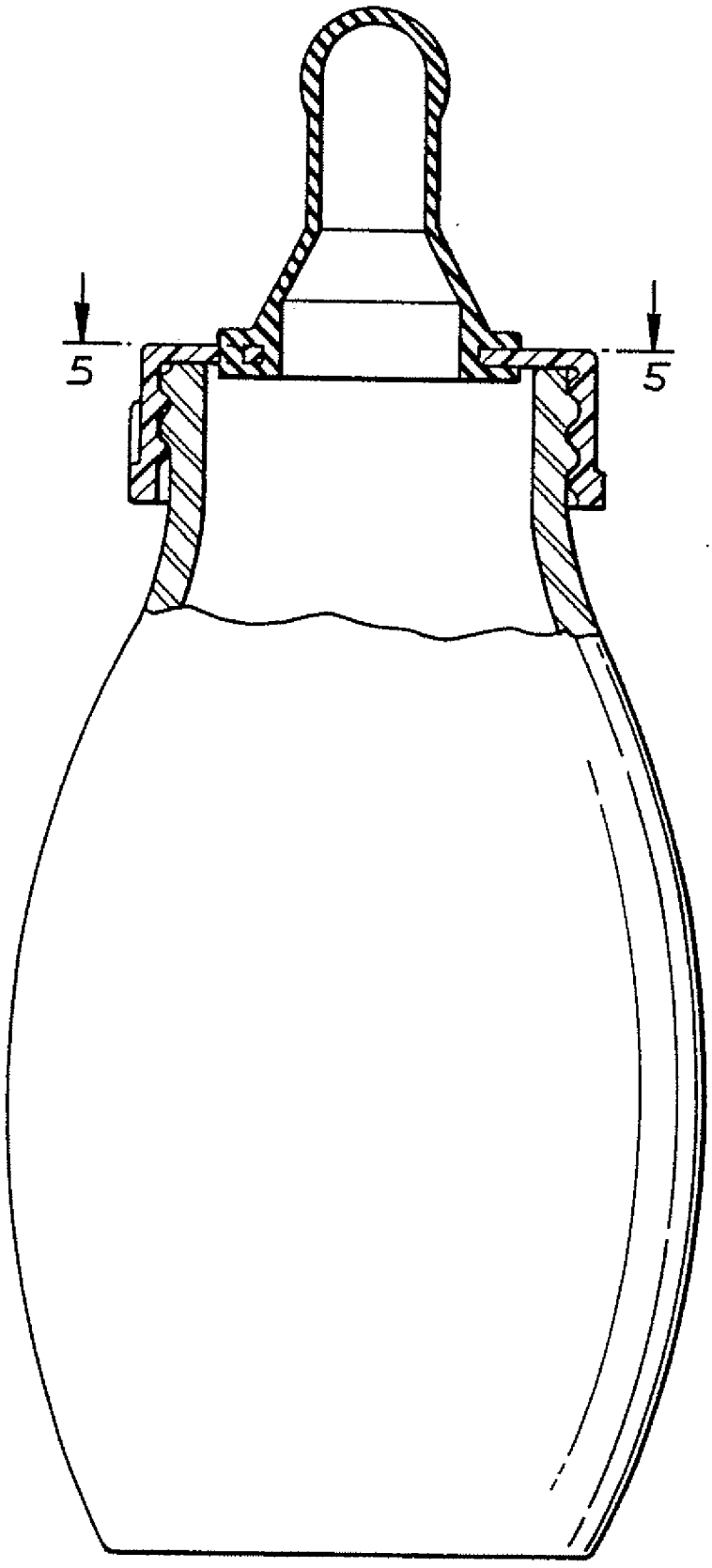


Fig. 4

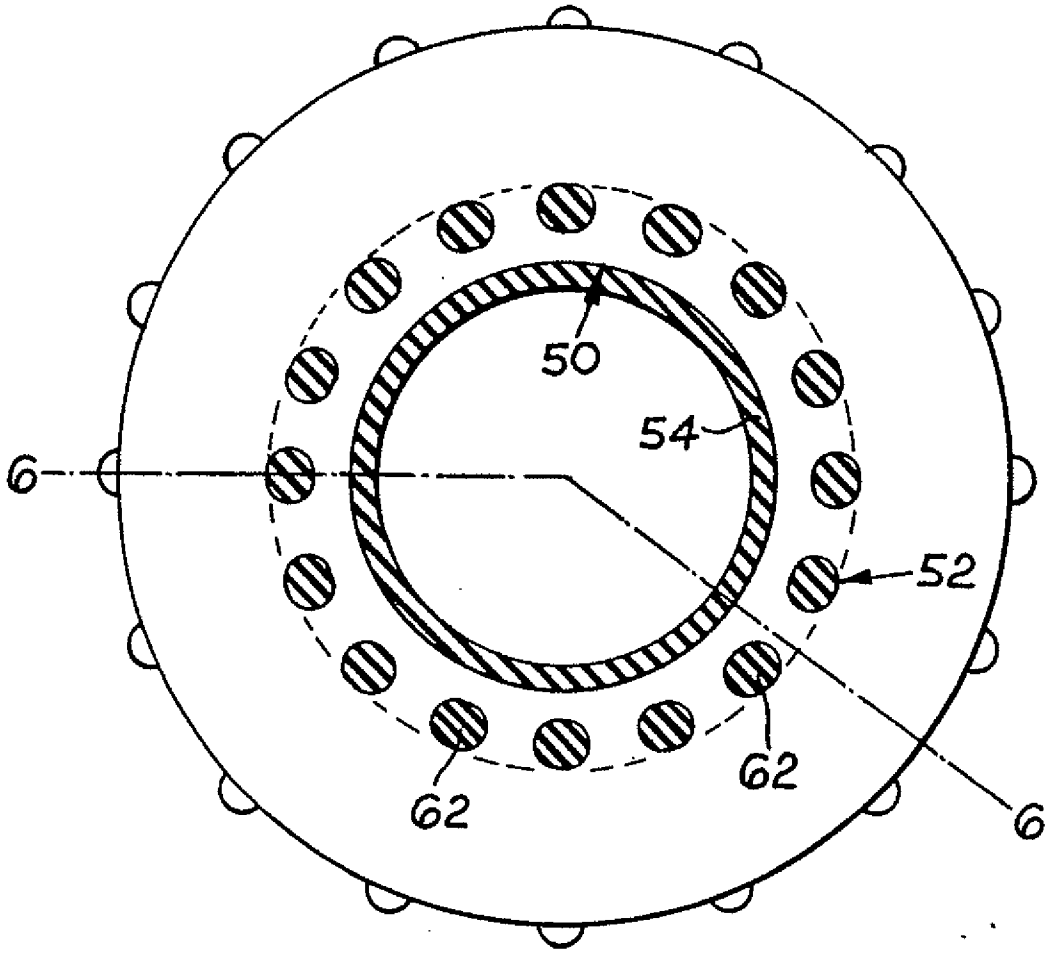


Fig. 5

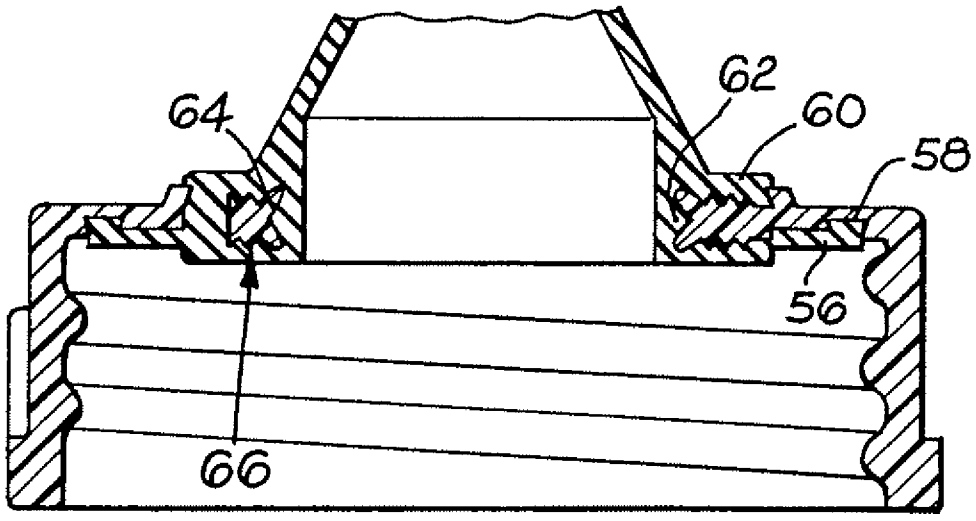


Fig. 6

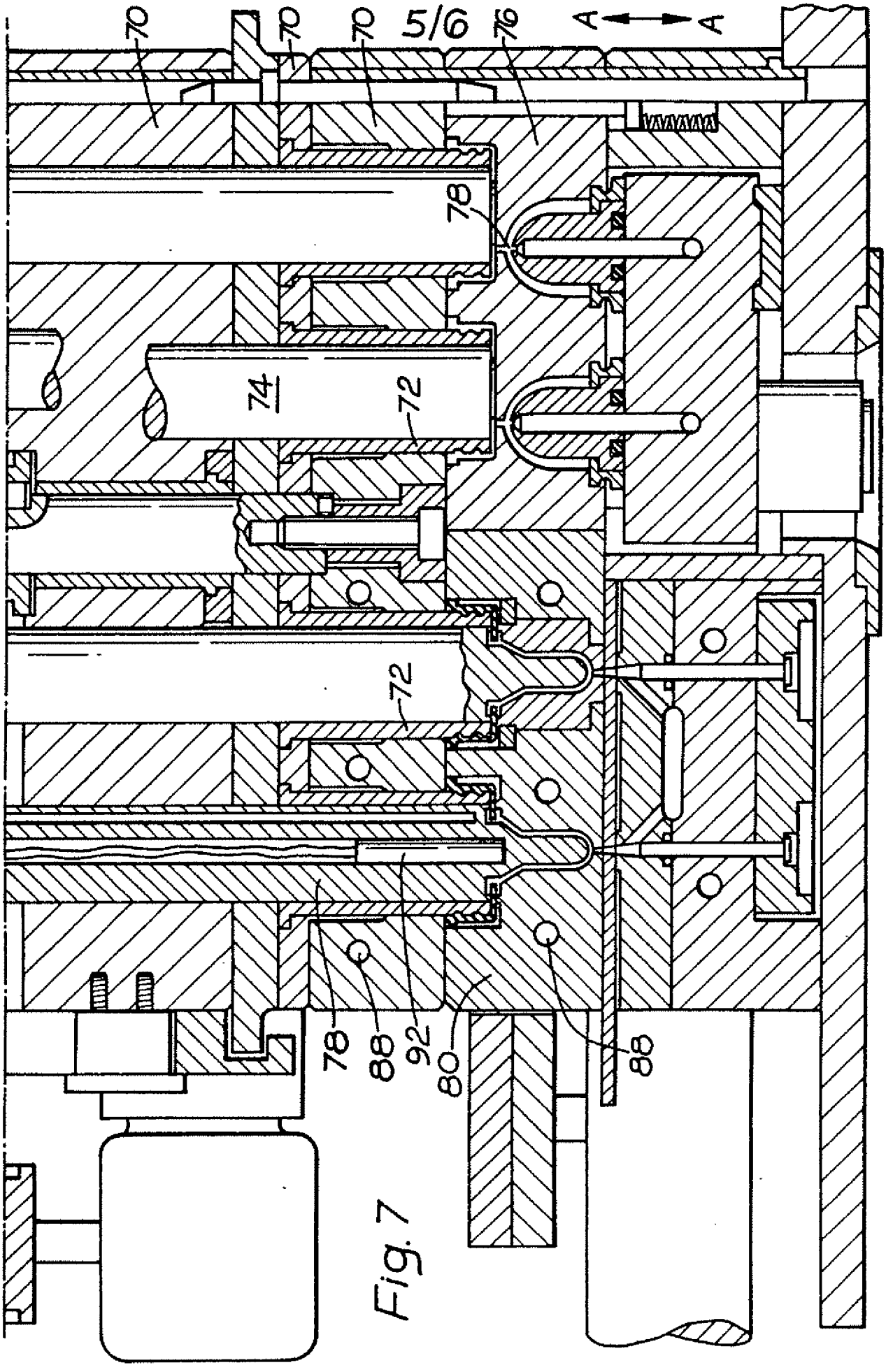


Fig. 7

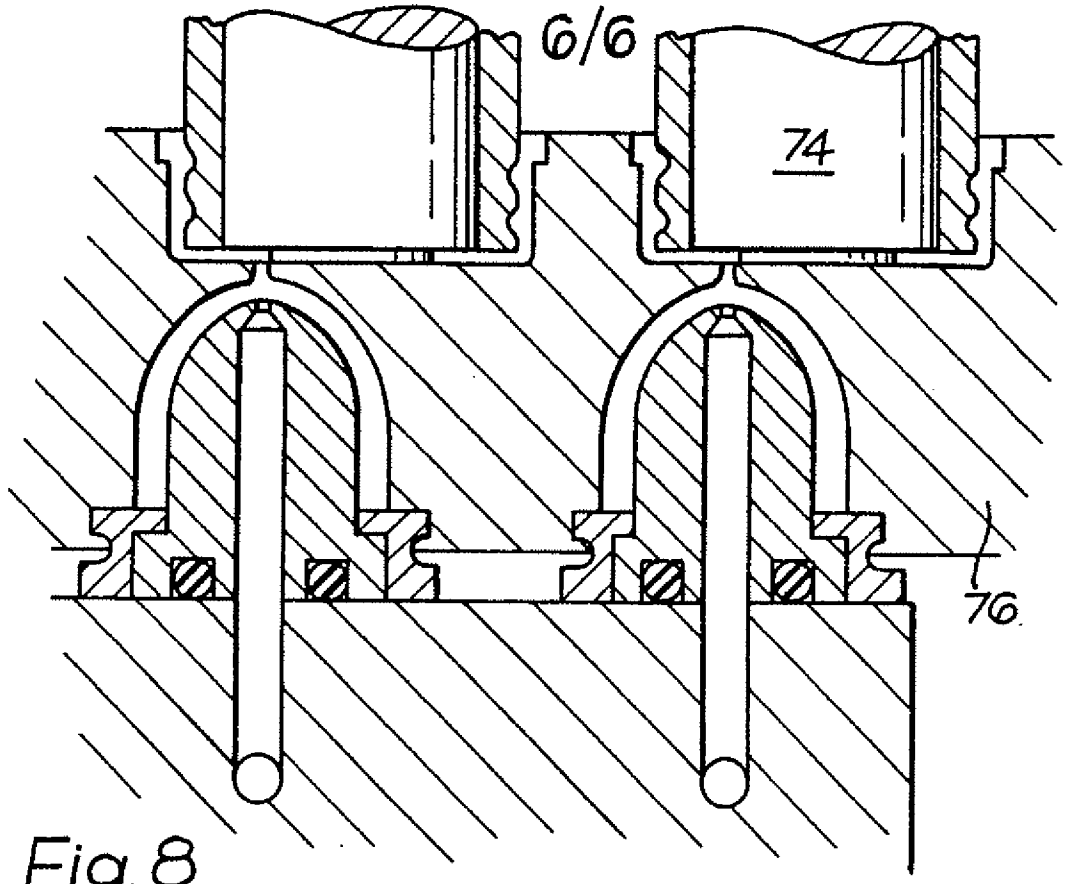


Fig. 8

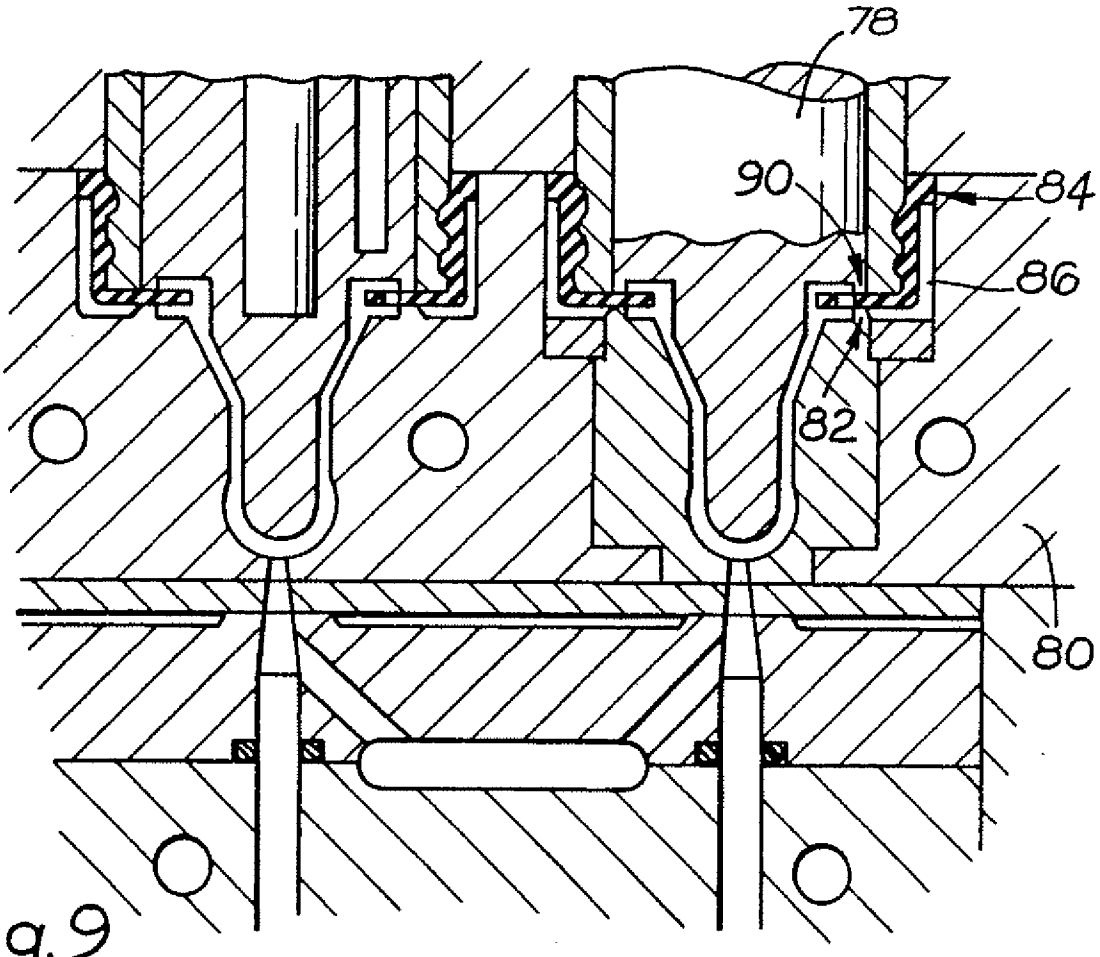


Fig. 9

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 86/00215

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: A 61 J 11/04; A 61 J 17/00; B 29 C 45/16

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	A 61 J

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 4195638 (DUCKSTEIN) 1 April 1980 see column 1, lines 54-68; column 2, lines 1-10, 30-40, 45-65; figures 2-4 --	1,2,3,5,7
X	US, A, 4297313 (DUCKSTEIN) 27 October 1981 see column 1, lines 61-68; column 2, lines 1-17, 37-47, 52-68; column 3, lines 1-4; figures 2-4 --	1,2,3,5,7
X	DE, A, 3316824 (MAPA) 8 November 1984 see claims 1,9,24; page 17, lines 17-30; page 18, lines 1-30; figures 1,2 --	1,3,7
X	US, A, 3650270 (FRAZIER) 21 March 1972 see column 1, lines 61-68; column 2, lines 15-27; figure 1 --	1,6
A	GB, A, 584080 (MIDDLETON) 6 February 1947	./.

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
25th June 1986	17 JUL 1986
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
	see page 1, lines 16-27; 34-58; page 2, lines 13-47; figure 1	4
A	FR, A, 1118226 (COMP. FRANCAISE THOMSON-HOUSTON) 1 June 1956 see page 1, right-hand column, lines 8-10; page 2, left-hand column, lines 1-2, 10-11; figure 2	1

INTERNATIONAL APPLICATION NO. PCT/GB 86/00215 (SA 12936)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 08/07/86

The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4195638	01/04/80	US-A- 4297313	27/10/81
US-A- 4297313	27/10/81	US-A- 4195638	01/04/80
DE-A- 3316824	08/11/84	DE-A- 3347876	23/05/85
US-A- 3650270	21/03/72	None	
GB-A- 584080		None	
FR-A- 1118226		None	